

described in UL 1191, as appropriate, are performed on a minimum of five samples in each of the lightest and darkest colors submitted for acceptance by a recognized laboratory accepted under § 164.019.

§ 164.013-6 Production tests, inspections, and marking.

Manufacturers shall provide in-plant quality control of polyethylene foam in accordance with the requirements of § 164.019-13 and any requirements of the recognized laboratory. The manufacturer of the foam has primary responsibility for quality control over the production of the foam.

§ 164.013-7 Marking.

(a) *General.* The manufacturer must ensure that each shipping label, and each unit of put-up, is permanently and clearly marked in a color which contrasts with the color of the surface on which the marking is applied. Each label must be marked with —

(1) The manufacturer's or supplier's name, trade name, or symbol;

(2) The unique style, part, or model number of the material;

(3) The thickness of the material;

(4) The lot number of the material; and

(5) The product Use Code or Codes.

(b) Each unit of put-up must be marked with the appropriate recognized laboratory's certification marking(s).

Subpart 164.015—Plastic Foam, Unicellular, Buoyant, Sheet and Molded Shape

SOURCE: CGFR 65-37, 30 FR 11593, Sept. 10, 1965 unless otherwise noted.

§ 164.015-1 Applicable specifications and standards.

(a) *Specifications.* The following specification and standard, of the issue in effect on the date the plastic foam material is manufactured, form a part of this subpart:

(1) Military specification:

MIL-F-859—Fuel Oil, Boiler.

(2) Federal specification:

C-C-91—Candle illuminating.

(3) Federal standard:

Standard 601—Rubber: Sampling and Testing.

(4) A.S.T.M. standard:

D1692T—Flammability of Plastic Foam and Sheeting.

(b) *Copies on file.* Copies of the specifications and standards referred to in this section shall be kept on file by the plastic foam manufacturer with this subpart.

(1) The Federal Specification and the Federal Standard may be purchased from the Business Service Center, General Services Administration, Washington, DC, 20407.

(2) The Military Specification may be obtained from the Commanding Officer, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pa. 19120.

(3) The A.S.T.M. Standard may be purchased from the American Society for Testing Materials, 1916 Race Street, Philadelphia, Pa. 19103.

[CGFR 65-37, 30 FR 11593, Sept. 10, 1965, as amended by CGFR 65-64, 31 FR 563 Jan. 18, 1966]

§ 164.015-2 Types.

(a) Unicellular expanded polyvinyl chloride-acetate copolymer or synthetic rubber modified polyvinyl chloride, polymer or copolymer plastic foam shall be of three types as follows: Type A—for life preservers, buoyant vests or buoyant cushions.

Type B—for buoyant vests or buoyant cushions.

Type C—for ring life buoys.

(b) [Reserved]

§ 164.015-3 Material and workmanship.

(a) The unicellular plastic foam shall be all new material complying with the requirements of this specification. The results of the tests described in § 164.015-4 shall yield property values within the limits shown in Table 164.015-4(a).

(b) The unicellular plastic foam shall be produced in sheet stock or molded shapes.

§ 164.015-4 Inspections and tests.

(a) *General.* Unicellular plastic foam to be used in a finished product subject to inspection by the Coast Guard also shall be subject to inspection at the plant where the foam is manufactured.

Coast Guard, DOT

§ 164.015-4

The manufacturer of the foam has primary responsibility for quality control over the production of the foam. A marine inspector shall be admitted to any place in the factory where production or partial processing of the foam takes place, and he may take samples of the foam or other materials for further inspections or tests. The manufacturer shall provide a suitable place and the

apparatus necessary for the performance of certain tests to be witnessed by the marine inspector, the results of which shall comply with Table 164.015-4(a). Unless otherwise specified, all tests shall be conducted at a temperature of 21 ± 3 °C. (70 ± 5 °F.) The properties listed in Table 164.015-4(a) shall be determined on specimens of sheet foam or molded shapes.

TABLE 164.015-4(A)

Properties	Test method	Units	Type A	Type B	Type C
Density (maximum)	164.015-4(b)	Pounds/feet ³	5.0	5.0	8.5
Buoyancy in fresh water (minimum)	164.015-4(c)	Pounds/feet ³	54.0	54.0	52.0
Volume loss on heat aging (maximum).	164.015-4(d)	Percent	5.0	5.0	4.0
Compression deflection at 25 percent.	164.015-4(e)	P.s.i.	3.0 max.	3.0 max.	7.0 min.
Compression set (maximum)	164.015-4(f)	Percent	24	24	20
Fire retardance (maximum)	164.015-4(g)(1)	Seconds	2	30
		Inches	1	3
	164.015-4(g)(2)	Inches per minute	4
Tensile strength (minimum)	164.015-4(h)	P.s.i.	30	20	60
Ultimate elongation (minimum)	164.015-4(h)	Percent	75	75
Water absorption (maximum)	164.015-4(i)	Pounds/feet ²	.06	.06	.06
Flexibility at 0±2F 164.015-4(j) No cracking No cracking					
Oil resistance	164.015-4(k)		(¹)	(¹)	(¹)
Odor	164.015-4(l)		(²)	(²)	(²)

¹ No softening or swelling.

² Not objectionable.

(b) *Density*. The density of the material shall be determined by dividing the weight of the material by its volume and shall be expressed in pounds per cubic foot. The volume shall be determined by measuring the volume of water displaced by the material or by direct measurement of the specimen using vernier calipers reading to 0.001 inch. A sheet specimen 4"×4"×thickness furnished shall be used unless the foam is molded shape, then the largest single piece so molded shall be used.

(c) *Buoyancy in fresh water*—(1) *Specimens*. The buoyancy test shall be made with a sample of the sheet material measuring 12"×12"×thickness of mate-

rial furnished or with the largest molded shape furnished.

(2) *Procedure*. Securely attach a spring scale in a position directly over a test tank. Suspend a weighted wire basket from the scale in such a manner that the basket can be weighed while completely submerged in water. Proceed as follows:

(i) Weigh the empty basket under water.

(ii) Place the sample inside the basket and submerge it so that the top of the basket is at least 2 inches below the surface of the water. Allow the samples to remain submerged for 24 hours.

(iii) After 24 hours submergence period, weigh the wire basket with the sample inside while both are still under water.

(iv) The buoyancy is computed as paragraph (c)(2)(i) of this section minus (c)(2)(iii) of this section. The resulting value is divided by the volume of the polyvinyl chloride foam expressed in cubic feet. The final result is in lbs./cu. ft.

(d) *Volume loss on heat aging*—(1) *Specimens*. Test specimens shall consist of pieces 4"×4"×the thickness of the material furnished. Where the foam is an object of molded shape, the largest single piece so molded shall be used for this test.

(2) *Procedure*. Volume before and after the heat aging test shall be determined by measuring the volume of water displaced by the material. The specimens shall be placed in an oven maintained at 140°±2 °F., for a period of one week. At the end of that period the specimens shall be removed from the oven and allowed to recover in the open for 5 hours at 70°±2 °F. before the measurement of final volume is made. The test shall be run in triplicate, the results averaged and the percentage of volume loss calculated.

(e) *Compression deflection*. Compression deflection shall be determined in accordance with method 12151 of Federal Standard 601, except that the deflection shall be maintained at 25 percent with automatic or manual control, and the load observed and recorded 60 seconds after the 25 percent deflection is reached.

(f) *Compression set*—(1) *Specimens*. The specimens shall have parallel top and bottom surfaces which shall be at right angles to the side surfaces. The specimens may be cylindrical or rectangular. The minimum dimension across the top shall be at least 1.0 times the thickness and the top a minimum of 1 square inch in area, and a maximum of 16 square inches in area.

(2) *Apparatus*. The apparatus shall consist of a compression device with two parallel plates, between which the test specimen shall be compressed by means of four studs and nuts. The plates may be steel, aluminum or any rigid smooth metal of sufficient thickness to withstand the required com-

pression stresses without bending. The surfaces against which the test specimens are held shall be smooth and shall be thoroughly cleaned and wiped dry before each test. Metal shims inserted between the plates shall be used to limit the compression of the specimen.

(3) *Procedure*. Thickness, before and after the compression set test shall be measured as specified in paragraph (h)(1) of this section. The test specimens shall be compressed 25% of the original thickness for 22 hours. At the end of that period, the test specimens shall be removed from the set apparatus and allowed to rest for 24 hours before measurement of final thickness is made. The compression set shall be calculated by means of the following formula:

$$\text{Compression set (percent)} = \frac{[(h_o - h_i) + (h_o - h_s)] \times 100}{(1)}$$

where:

h_o =the original thickness.

h_i =the thickness 24 hours after removal from apparatus.

h_s =the test compression thickness.

(g) *Fire retardance*—(1) *Types A and C foams*. The test specimens shall be ¼ inch in thickness, 1 inch in width and approximately 6 inches in length. The specimens shall be clamped at one end in a position such that the long dimension forms a 45° angle with the horizontal and with the widths in a vertical position. A bunsen burner with a 1 inch yellow flame shall be applied to the lower or free end of the specimen for 15 seconds. The burner shall then be removed and the time that the specimen continues to burn after removal of the burner shall be recorded as burning time. The length of char shall also be recorded. The test shall be performed in a location free from drafts. The average results of three determinations shall be reported. A plain wax candle equivalent to those meeting Federal Specification C-C 91 may be substituted for the bunsen burner.

(2) *Type B foam*. The test specimens shall be ½ inch in thickness, 2 inches in width and approximately 6 inches in length. The specimens shall be tested in accordance with American Society for Testing Materials Designation D-1692T specification standard.

(h) *Tensile strength and the ultimate elongation*—(1) *Specimens*. The test specimens shall be dumbbell shaped, conforming in shape to die I of method 4111 of Standard FED-STD-601. The thickness of the specimen shall be $\frac{1}{4}$ inch. Two specimens shall be taken from the center of the sample piece and two from one side, keeping the skin surface intact. The thickness shall be measured to the nearest 0.001 inch by a suitable measurement device such as a vernier caliper with a sliding vernier to read 0.001 inch. Care shall be taken not to compress or distort the specimen when measuring. The specimens taken from the center will be skinless; the others will have skin on one side. One-inch bench marks shall be placed midway on the constricted portion of the tensile specimen.

(2) *Procedure*. (i) The tensile strength of the specimens shall be determined in a standard tensile testing machine with a rate of separation of jaws set at 2 inches per minute. The bench marks shall be followed with a suitable pair of dividers until the specimen ruptures. A minimum of 4 specimens shall be tested and if any specimen breaks at the clamp or any specimen exhibits any obvious defects, the results obtained therewith shall be discarded. A new similar specimen shall then be prepared and tested. The tensile strength shall be calculated by dividing the breaking load (to the nearest 0.1 pound) by the original area of the cross section of the specimen in square inches and the result shall be expressed in pounds per square inch. The percent ultimate elongation shall be calculated as follows:

$$D_1 - D \div D \times 100 \quad (2)$$

where:

D = distance between knife edges of bench marker.

D₁ = distance between bench marks at moment of rupture to the nearest $\frac{1}{32}$ inch.

(3) *Averaging determinations*. The tensile strength in pounds per square inch and percent ultimate elongation of four determinations shall be averaged for each sample.

(i) *Water absorption*—(1) *Specimens*. Test specimens shall be 4"x4" square and approximately 1" in thickness. The specimen may have the natural skin on the top and bottom surfaces.

(2) *Procedure*. The specimens shall be weighed and submerged in water under a 10-foot head of water (equal to 4.35 psi) at room temperature (65°-95 °F.) for 48 hours. The specimens shall then be placed in a stream of air for the minimum time required to remove visible water from the surface, and reweighed. The results shall be calculated in terms of pounds of water gain per square foot of total exposed surface.

(j) *Flexibility*—(1) The size of the specimen shall be approximately 1'x8' with a thickness of $\frac{1}{4} \pm \frac{1}{16}$ ". The test specimens and equipment shall be conditioned for at least 4 hours at 0 °F. ± 2 °F., and bent 180° around a $\frac{1}{2}$ " diameter steel mandril within 5 seconds at the test temperature. Care shall be taken to avoid warming the test specimens, particularly at or near the bend point, in performing the test.

(k) *Oil resistance*—(1) *Specimens*. The test specimens shall be a disk approximately 1" in diameter and 1" (approximately) in thickness.

(2) *Procedure*. The specimen shall be immersed in fuel oil conforming to Navy special grade of Specification MIL-F-859 for 70 hours. The specimen shall then be removed, dipped in alcohol and blotted with filter paper. The specimen shall then be compared to an untreated specimen of similar size for apparent softness and visible swelling.

(l) *Odor*. The odor of unicellular polyvinyl chloride foam shall be determined by sniffing.

[CGFR 65-37, 30 FR 11593, Sept. 10, 1965, as amended by CGFR 65-64, 31 FR 563, Jan. 18, 1966]

§ 164.015-5 Procedure for acceptance.

(a) Unicellular plastic foam is not subject to formal approval, but will be accepted by the Coast Guard on the basis of this subpart for use in the manufacture of lifesaving equipment utilizing it.

(b) Upon receipt of an application requesting acceptance, the Commander of the Coast Guard District will detail a marine inspector to the factory to observe the production facilities and manufacturing methods and to select from foam already manufactured sufficient sample material for testing for compliance with the requirements of